Performance Summary, ngVLA Bands 1-6 (7/15/2021)
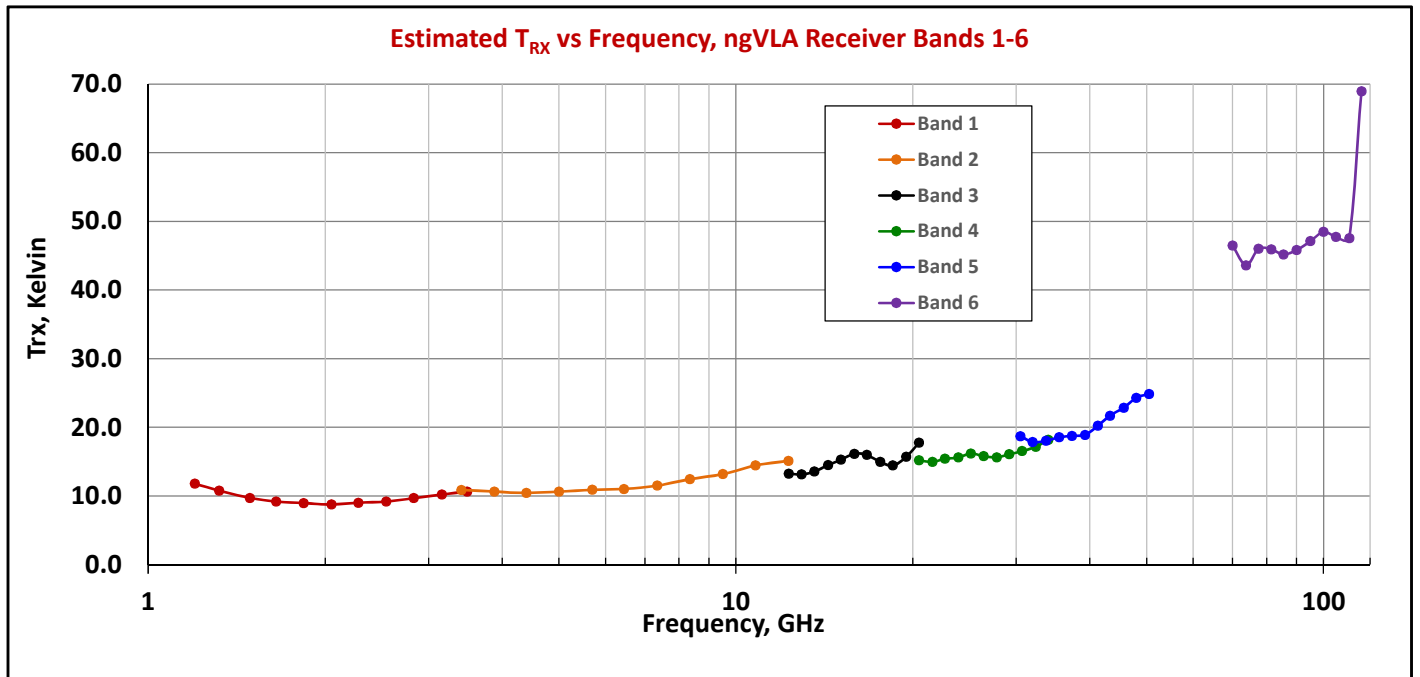
Notes:

1. Summary table is compiled from the other worksheets.
2. Changing input values (upper right) recalculates values.
3. The sensitivity (Aeff/Tsys) is a function of selected array size.

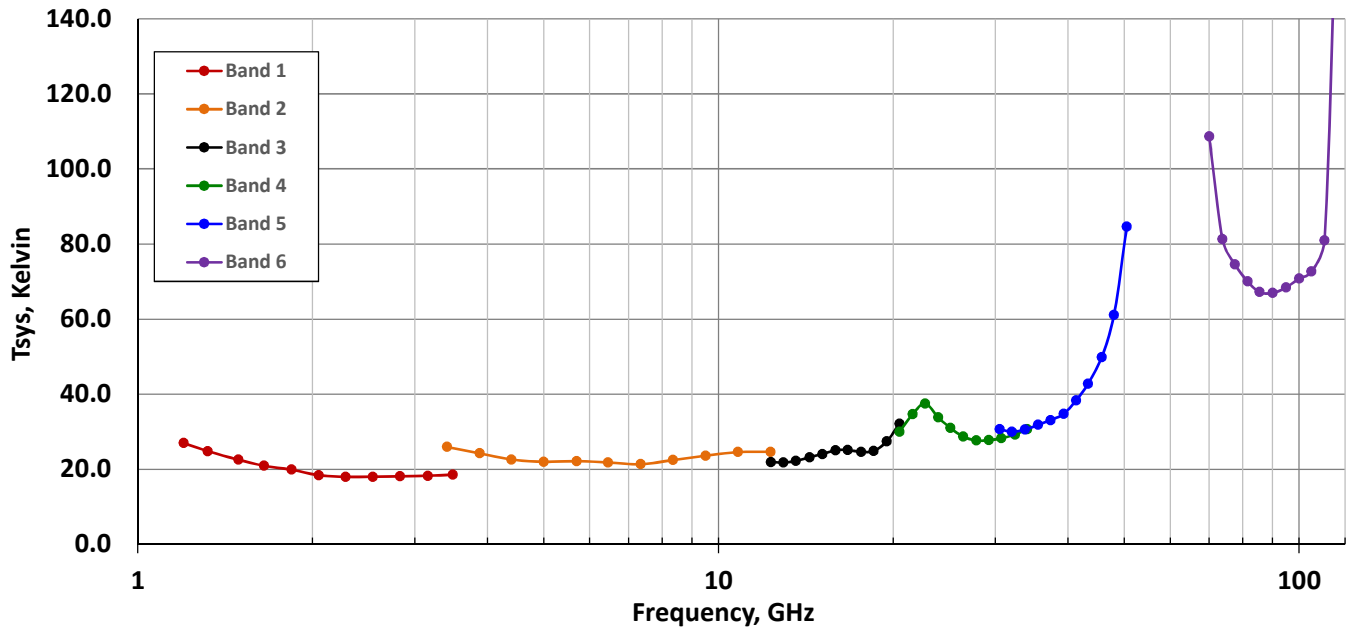| Input	Value		Stage Temp
Surface Tol. (µm RMS):	160	20	20K Stage Temp (K)
Antenna Elevation (deg):	60	50	Inter-Stage Temp (K)
Atmosphere PWV (mm):	6	80	80K Stage Temp (K)
Array Size (1 x 18m, Full):	Single	190	Intermed. Stage Temp (K)
Averaging Range (%BW):	80%	300	Ambient Stage Temp (K)

Freq.	Gain	Trx	Tspill	Tsky	η_A	Tsys	A_E/T_{SYS}	P_{OUT}
GHz	dB	K	K	K		K	m²/K	dBm/GHz
1.20	24.8	11.8	5.9	8.4	0.799	27.0	7.53	-69.5
1.32	25.7	10.8	5.3	7.8	0.809	24.8	8.30	-68.9
1.49	26.3	9.7	4.3	7.6	0.827	22.6	9.33	-68.8
1.65	26.1	9.2	3.5	7.3	0.846	20.9	10.3	-69.3
1.84	25.7	9.0	2.8	7.2	0.867	19.9	11.1	-69.9
2.05	25.3	8.8	1.6	7.1	0.885	18.4	12.2	-70.6
2.28	25.1	9.0	1.0	7.0	0.878	18.0	12.4	-71.0
2.54	24.8	9.2	1.0	6.9	0.863	18.0	12.2	-71.3
2.83	24.7	9.7	0.7	6.9	0.833	18.1	11.7	-71.4
3.16	24.7	10.2	0.3	6.8	0.773	18.3	10.8	-71.3
3.49	24.6	10.7	0.2	6.8	0.657	18.6	9.01	-71.3
3.41	35.4	10.9	7.4	6.8	0.922	25.9	9.05	-59.1
3.88	35.2	10.7	6.0	6.8	0.929	24.2	9.76	-59.5
4.40	34.7	10.5	4.5	6.8	0.932	22.6	10.5	-60.4
5.00	34.1	10.6	3.8	6.8	0.930	22.0	10.8	-61.1
5.70	34.0	10.9	3.7	6.8	0.931	22.2	10.7	-61.1
6.45	34.2	11.0	3.3	6.7	0.937	21.8	10.9	-61.0
7.35	34.8	11.5	2.4	6.7	0.939	21.3	11.2	-60.5
8.35	35.2	12.5	2.5	6.8	0.938	22.5	10.6	-59.8
9.50	35.4	13.2	3.0	6.9	0.947	23.6	10.2	-59.5
10.80	35.2	14.5	2.7	6.9	0.940	24.6	9.74	-59.5
12.29	35.1	15.1	2.1	6.9	0.922	24.6	9.52	-59.6
12.31	33.1	13.2	1.2	7.0	0.928	21.9	10.8	-62.1
12.94	32.6	13.1	1.1	7.1	0.932	21.8	10.9	-62.6
13.60	32.2	13.6	1.0	7.2	0.935	22.2	10.7	-62.9
14.35	32.8	14.5	1.0	7.2	0.938	23.2	10.3	-62.1
15.10	32.9	15.3	1.0	7.4	0.940	24.0	9.95	-61.9
15.90	32.5	16.2	0.9	7.6	0.942	25.1	9.57	-62.1
16.70	32.0	16.0	0.9	7.9	0.944	25.1	9.57	-62.6
17.60	32.1	15.0	0.9	8.5	0.945	24.6	9.76	-62.6
18.50	32.5	14.5	0.9	9.2	0.945	24.9	9.68	-62.1
19.50	32.5	15.7	0.9	10.5	0.944	27.4	8.76	-61.7
20.50	31.9	17.8	0.9	13.2	0.939	32.1	7.44	-61.6

Freq.	Gain	Trx	Tspill	Tsky	η_A	Tsys	A_E/T_{SYS}	P_{OUT}
GHz	dB	K	K	K		K	m²/K	dBm/GHz
20.5	31.2	15.2	1.3	13.2	0.918	30.0	7.80	-62.7
21.6	30.5	15.0	1.3	18.2	0.922	34.7	6.76	-62.7
22.7	29.3	15.4	1.3	20.7	0.924	37.5	6.27	-63.5
23.9	28.9	15.6	1.2	17.0	0.925	33.8	6.96	-64.4
25.1	28.2	16.2	1.1	13.6	0.925	31.0	7.60	-65.4
26.4	26.5	15.8	1.0	11.9	0.925	28.7	8.19	-67.6
27.8	24.8	15.6	0.9	11.1	0.925	27.6	8.51	-69.4
29.2	25.2	16.1	0.9	10.8	0.923	27.8	8.47	-69.0
30.7	25.1	16.5	0.9	10.8	0.921	28.2	8.30	-69.0
32.4	25.0	17.2	0.9	11.3	0.917	29.2	7.99	-68.9
34.0	25.0	18.2	0.9	11.8	0.911	30.7	7.55	-68.8
30.5	32.2	18.7	1.2	10.9	0.899	30.7	7.45	-61.6
32.0	32.0	17.9	1.2	11.1	0.900	30.0	7.64	-61.8
33.7	31.6	18.0	1.1	11.6	0.899	30.5	7.49	-62.2
35.5	33.0	18.5	1.1	12.4	0.897	31.8	7.18	-60.6
37.3	33.1	18.8	1.1	13.5	0.895	33.1	6.88	-60.3
39.3	33.3	18.9	1.1	15.1	0.891	34.7	6.53	-59.9
41.3	33.6	20.2	1.1	17.4	0.887	38.3	5.89	-59.2
43.3	33.9	21.7	1.1	20.5	0.883	42.8	5.25	-58.4
45.7	34.2	22.9	1.2	26.4	0.876	49.9	4.47	-57.4
48.0	34.0	24.3	1.2	36.2	0.868	61.1	3.61	-56.7
50.5	32.4	24.9	1.3	59.2	0.856	84.6	2.58	-57.0
70.0	35.3	46.5	0.6	62.4	0.753	108.6	1.76	-53.0
73.8	35.5	43.6	0.5	38.0	0.739	81.3	2.31	-54.0
77.5	35.7	46.0	0.4	29.0	0.723	74.6	2.47	-54.2
81.5	35.8	45.9	0.3	24.5	0.705	70.0	2.56	-54.3
85.5	35.9	45.2	0.3	22.5	0.686	67.2	2.60	-54.4
90.0	36.0	45.8	0.3	21.7	0.664	67.0	2.52	-54.4
95.0	36.0	47.2	0.2	21.9	0.639	68.4	2.38	-54.2
100.0	36.1	48.5	0.2	23.0	0.613	70.8	2.20	-54.0
105.0	36.1	47.7	0.2	25.8	0.586	72.7	2.05	-53.9
110.6	36.1	47.6	0.2	34.3	0.556	81.0	1.75	-53.4
116.0	36.1	69.0	0.3	103.2	0.524	171.2	0.78	-50.1

Estimated T_{RX} vs Frequency, ngVLA Receiver Bands 1-6

Estimated T$_{SYS}$ vs Frequency, ngVLA Reference Bands 1-6

Legend: Band 1, Band 2, Band 3, Band 4, Band 5, Band 6

Y-axis: Tsys, Kelvin (0.0 to 140.0)
X-axis: Frequency, GHz (1 to 100)

Total Averaged Values for each Band, 80% or Full Bandwidth								
Band	Gain	Trx	Tspill	Tsky	η_A	Tsys	A$_E$/T$_{SYS}$	P$_{AVG}$
#	dB	K	K	K		K	K	dBm/GHz
1	25.4	9.5	2.3	7.2	0.842	19.9	10.9	-70.27
2	34.8	11.7	3.5	6.8	0.936	22.7	10.5	-60.27
3	32.5	14.9	0.9	8.1	0.941	24.2	9.9	-62.30
4	27.1	15.9	1.1	13.9	0.923	31.0	7.7	-66.65
5	33.2	20.1	1.1	18.3	0.888	39.1	6.1	-59.61
6	35.9	46.4	0.3	26.8	0.657	72.6	2.3	-54.08

Worst-Case Values for each Band, 80% or Full Bandwidth								
Band	Gain	Trx	Tspill	Tsky	η_A	Tsys	A$_E$/T$_{SYS}$	P$_{MIN}$
#	(min)	(max)	(max)	(max)	(min)	(max)	(min)	dBm/GHz
1	24.7	10.8	5.3	7.8	0.773	24.8	8.3	-71.36
2	34.0	14.5	6.0	6.9	0.929	24.6	9.7	-61.14
3	32.0	16.2	1.1	10.5	0.932	27.4	8.8	-62.89
4	24.8	17.2	1.3	20.7	0.917	37.5	6.3	-69.38
5	31.6	24.3	1.2	36.2	0.868	61.1	3.6	-62.20
6	35.5	48.5	0.5	38.0	0.556	81.3	1.7	-54.40

Full-bandwidth Dynamic Range (at 1% compression point)						
Band	P$_{OUT}$	BW	P$_{OUT}$	P$_{1dB}$	P$_{1\%}$	HR$_{CW}$	HR$_{NOI}$
#	dBm/GHz	GHz	dBm	dBm	dBm	dB	dB
1	-70.30	2.29	-66.70	-3.00	-15.00	51.70	46.70
2	-60.10	8.88	-50.61	-10.00	-22.00	28.61	23.61
3	-62.22	8.19	-53.08	-10.00	-22.00	31.08	26.08
4	-66.48	13.50	-55.18	-12.00	-24.00	31.18	26.18
5	-59.55	20.00	-46.53	-15.00	-27.00	19.53	14.53
6	-53.63	46.00	-37.00	-15.00	-27.00	10.00	5.00